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chromosomes. In *N. undulata* the two chromosomes in question are always separate; in *N. irrorata* are always united to form a single body; and in *N. insulata* they may be separated in the first spermatocyte division, but are united in the second.

The author traces the origin of the chromosomes from the karyosphere in the three species, and their behavior in the growth stages and maturation divisions.

#### INTERSTITIAL CELLS OF TESTIS AND SECONDARY SEX CHARACTERS

J. des Cilleuls (C. R. Soc. Biol. Paris, 1912, p. 371) finds a strict coincidence in the development of the interstitial cells of the testis and the secondary sexual characteristics of the cock. In chickens the external marks of sex do not begin to appear until about the thirtieth day. By the time the chicks are 45 days old the pullets show a greater development of the tail feathers and the cockerel more color and size of comb. The sex distinctions increase from this point. The author claims that the secondary sex characters in the male bird begin to show with the oncoming of the interstitial cells, and increase as these increase. The author believes that the secretion of the interstitial cells acts as a hormone in stimulating the growth of the characteristic male secondary structures.

#### MICROBIOLOGY IN RELATION TO DOMESTIC ANIMALS

This book, entitled "Principles of Microbiology," with a subtitle "A Treatise on Bacteria, Fungi, and Protozoa Pathogenic for Domesticated Animals," is written primarily for veterinary students beginning the study of microbiology. It consists, in about equal parts, of matter belonging to general bacteriology and to special applications of this to veterinary science. In the very nature of the case this makes the treatment of general bacteriology somewhat less satisfactory than may be had from text-books on this subject, and limits the author somewhat in his treatment of the part of the subject which is peculiar to the book.

The first twelve chapters are given to such subjects as the biology, morphology, classification of bacteria; the apparatus, methods of sterilization, cultivation, staining, and examination of bacteria; the relation of bacteria to disease. In the part relating to

the work of the veterinarian there are, first, two introductory chapters dealing with the Use of Animals in Bacteriological Examinations and Investigations, and the Bacteriology of Water and Milk. These are followed by eight chapters dealing with the various principal genera and species of microorganisms that produce diseases in domestic animals, together with their pathogenesis and, where known, the treatment. These chapters present very valuable material for the general student of biology, as well as for the veterinarian.

In the concluding chapters the author discusses some of the broader questions of physiology, theory, diagnosis and therapy of the bacterial diseases under the heads:—Specific Bacterial Products, Tissue Reactions and Immunity; Serum Diagnosis; Immunity and Vaccine Therapy. This resumé is very readable and valuable to the general student. The mechanical excellence of the book is all that could be desired.

*Principles of Microbiology*, by V. A. Moore. Pages 506; illustrated. Carpenter & Co., Ithaca, N. Y. Price \$3.50.

#### BEGINNERS GUIDE TO THE MICROSCOPE

This is an elementary handbook designed to aid the untechnical person to use the microscope for his own pleasure and that of his friends. The need of such a book seems to the author to lie in the great complexity of the modern instrument and the wealth of its accessories, and in the elaborate character of the modern books about the microscope. In a very simple, gossipy way quite suitable to his expressed purpose, the author describes the microscope and its essential parts, the formation of images, illumination; discusses the principles that should guide in the choice of an instrument; gives rules for the use of the instrument and for its care; tells of interesting objects for temporary mounts. There are also sections on the home aquarium, on collecting objects, on mounting for permanent display, and on storing slides.

In many ways it is much to be regretted that there are not more of our modern Americans who turn to such methods of interest and diversion as are suggested here. The use of the microscope as a serious instrument of education and research in schools has in-